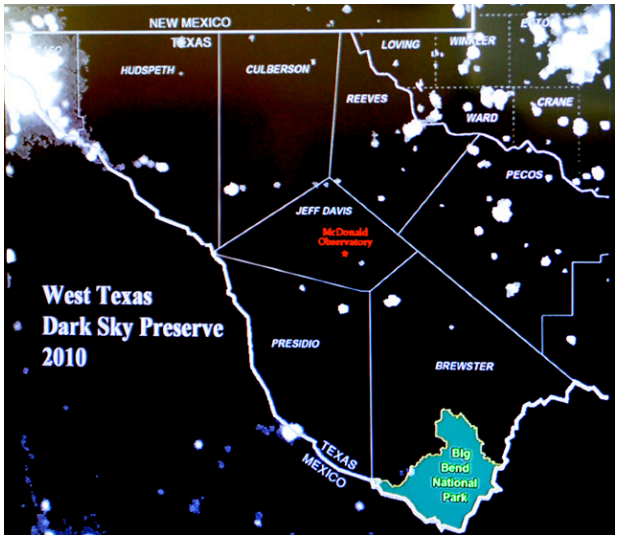
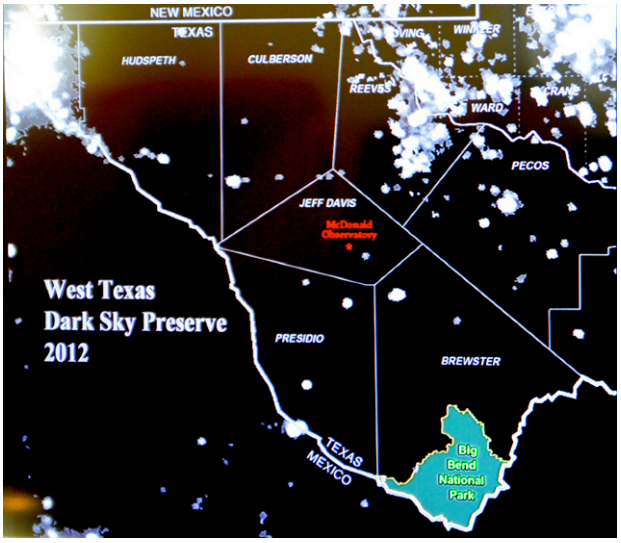
OILFIELD LIGHTING THREATENS DARK SKIES
Pioneer Drilling Rig#29 and McDonald Observatory

McDonald Observatory
Fort Davis,Texas

A Texas landmark for 75 years.

McDonald Observatory is a world class astronomical research facility increasingly threatened by nighttime lighting from oil and gas related activities in and around the Permian Basin. Established in the remote Davis Mountains of West Texas in 1932, the observatory is home to some of the world's largest telescopes and darkest skies. Since 2010, the sky along the observatory's northern horizon has been steadily and rapidly brightening. This excessive skyglow is coming from temporary activities such as drilling and flaring, and from permanent installations for storage, pumping, and disposal.





Satellite images from 2010 (left) and 2012 (right) show the increase in lighting from the oilfield. Clouds reflect the glow as seen looking northeast from McDonald Observatory (below).

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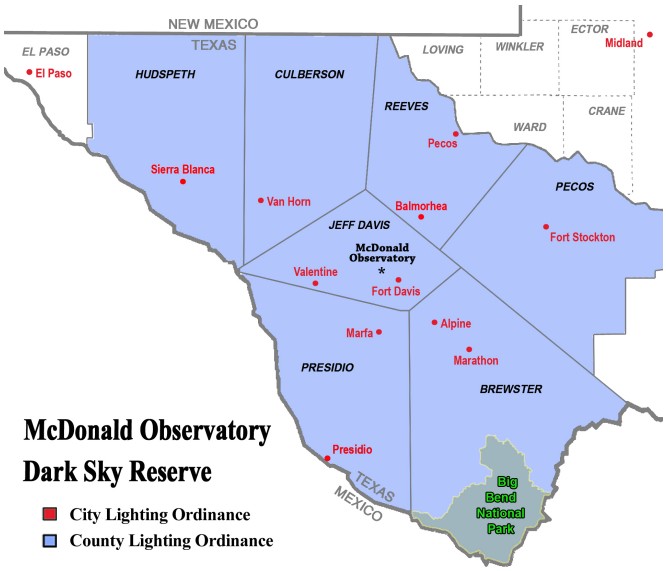

In 2011, the Texas legislature passed HB 2857, signed into law by Governor Rick Perry that June. The law, which went into effect on January 1, 2012, instructs the seven counties surrounding McDonald Observatory to adopt outdoor lighting ordinances designed to preserve the dark night skies for ongoing astronomical research at the University of Texas facility. Most of the cities and counties in this 28,000-square-mile region had already done so voluntarily. The effected counties are: Brewster, Culberson, Hudspeth, Jeff Davis, Pecos, Presidio, and Reeves.

PIONEER RIG#29

Beginning July, 2013, McDonald Observatory was granted access to a working rig, Pioneer Energy Services Rig#29. Every time the rig moves to a new location, there is opportunity to install shields, re-aim floodlights, and evaluate effectiveness. The goal is to mitigate excessive uplight without jeopardizing safety. In fact, it has been demonstrated that in many cases nighttime visibility on the rig can be significantly improved.

SAFETY and GLARE

Safe nighttime operations depend on good visibility. Many light fixtures are sources of blinding glare due to of lack of shielding, poor placement, or poor aiming. During an early visit to Rig#29, workers pointed out conditions of poor visibility due to glare from an unshielded and poorly placed fixture, what rig hands refer to as a “360” light, a blast resistant, teardrop shaped globe surrounded by a wire mesh.

Poor visibility from a glaring light source.

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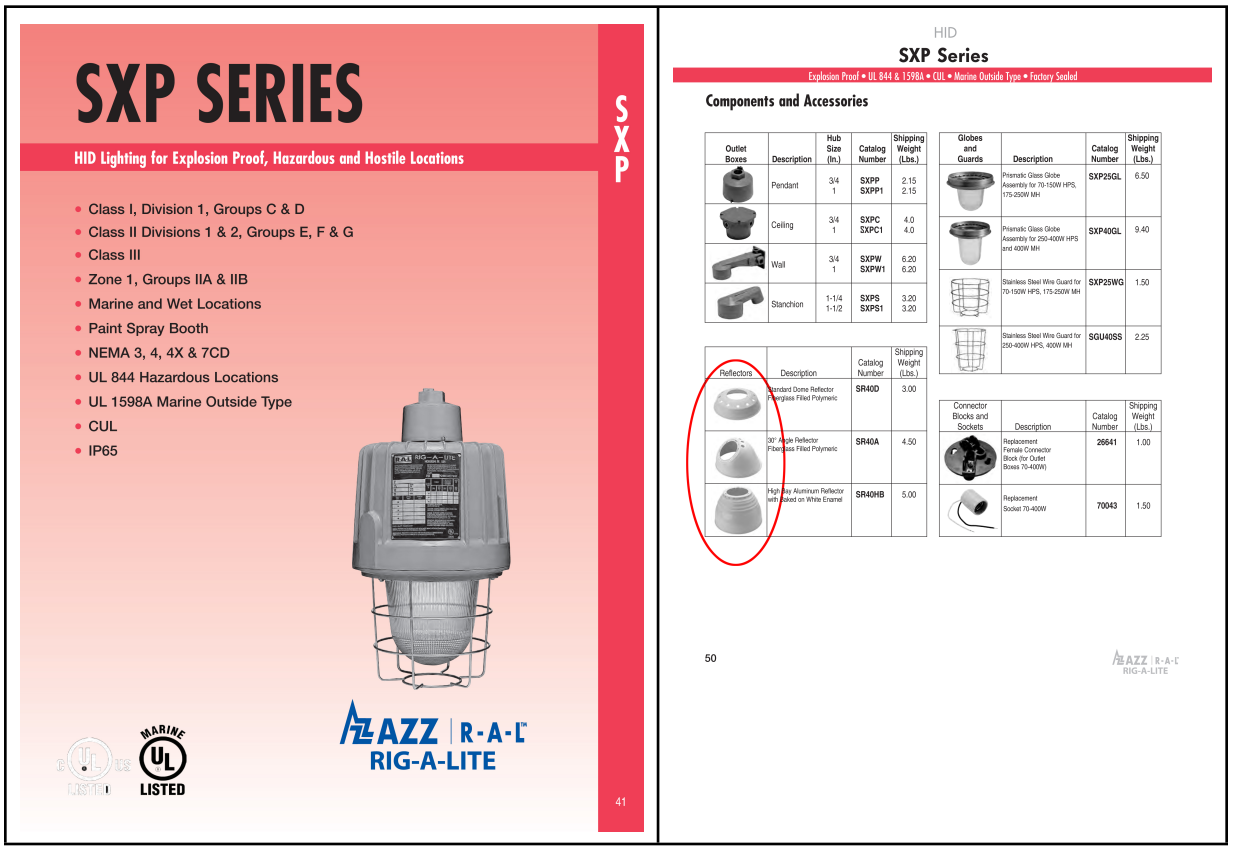
The light was in the direct line of site of gauges and controls the driller must see for safe operations. The fixture had been fitted with a makeshift glare shield, a rag stuffed between the wire mesh and the globe.

SHIELDING THE "360" LIGHT



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Components and Accessories

Outlet Boxes	Description	Hub Size (In.)	Catalog Number	Shipping Weight (Lbs.)
	Pendant	3/4 1	SXPP SXPP1	2.15 2.15
	Ceiling	3/4 1	SXPC SXPC1	4.0 4.0
	Wall	3/4 1	SXPW SXPW1	6.20 6.20
	Stanchion	1-1/4 1-1/2	SXPS SXPS1	3.20 3.20

Reflectors	Description	Catalog Number	Shipping Weight (Lbs.)
	Standard Dome Reflector Fiberglass Filled Polymeric	SR40D	3.00
	90° Angle Reflector Fiberglass Filled Polymeric	SR40A	4.50
	High Bay Aluminum Reflector with Baked on White Enamel	SR40HB	5.00

Globes and Guards	Description	Catalog Number	Shipping Weight (Lbs.)
	Prismatic Glass Globe Assembly for 70-150W HPS, 175-250W MH	SXP25GL	6.50
	Prismatic Glass Globe Assembly for 250-400W HPS and 400W MH	SXP40GL	9.40
	Stainless Steel Wire Guard for 70-150W HPS, 175-250W MH	SXP25WG	1.50
	Stainless Steel Wire Guard for 250-400W HPS, 400W MH	SGU40SS	2.25

Connector Blocks and Sockets	Description	Catalog Number	Shipping Weight (Lbs.)
	Replacement Ferrule Connector Block (for Outlet Boxes 70-400W)	26641	1.00
	Replacement Socket 70-400W	70043	1.50

50

AZZ | R-A-L RIG-A-LITE

Most lighting manufacturers offer optional glare shields, or "reflectors", for a variety of fixture models. The overall effectiveness of shields depends on mounting height, the extent of the shielding, and aiming. Initial tests shielding "360" lights with large shields resulted in reduced glare, but many fixtures are mounted too low to provide adequate illumination over large areas. Fixtures are taken down every few weeks when the rig moves then reinstalled at a new

location. Taller poles are too cumbersome for frequent relocation, so the large, deep shields are inadequate for these lights at low mounting heights. However, the same fixtures mounted around the outside of the rig over stairways provided more illumination on the stairs when fitted with the deeper shields (below).

Before shielding.

After shielding.

This particular fixture is yoke mounted and can be fitted and aimed with the 30-degree shield option offered by the manufacturer. These succeeded in reducing glare and providing adequate coverage, even with lower mounting height. They also have the advantages of being less expensive, fiberglass instead of spun aluminum, smaller for less wind loading, less likely to be damaged during transport, and easier to replace. Extra shields can be kept on hand.

FLOODLIGHTS

Manufacturers typically offer optional shields or visors for directional floodlights as well. Shielding proved effective in reducing glare and reflecting light that was being wasted skyward back down. Installing shields on floodlights also provides an opportunity to re-aim them, although it is more effective to point floods at night, directing light to where it is needed.

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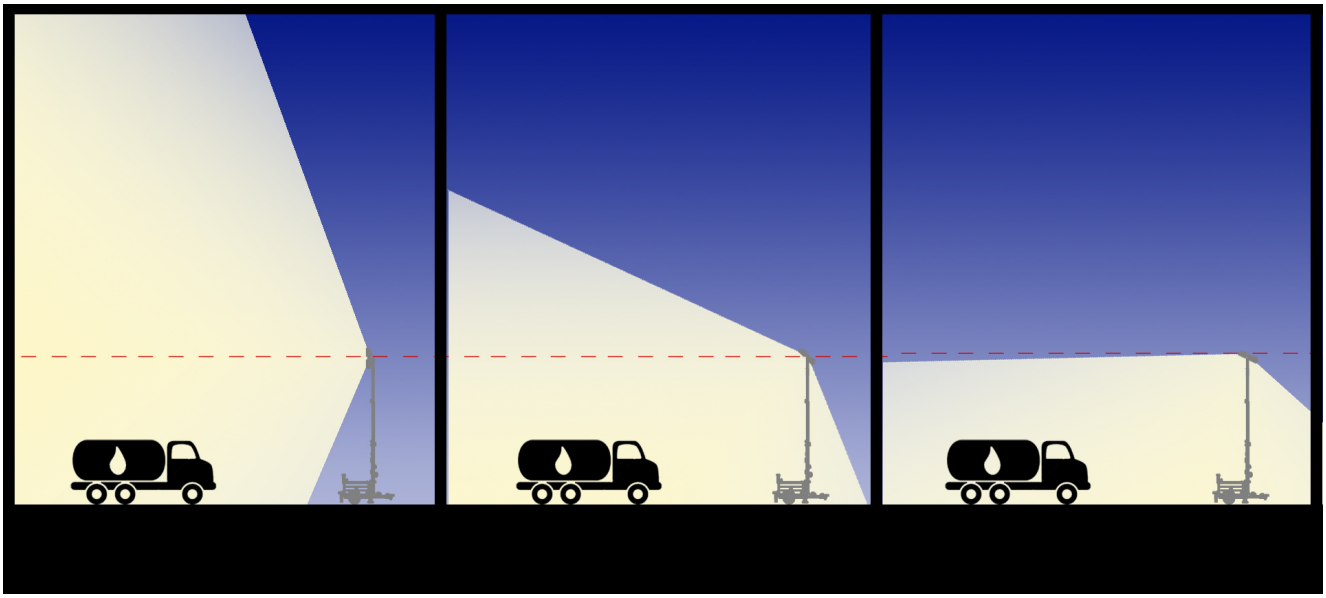
LIGHT TOWERS

Mobile light towers like those widely used for drilling and completion operations, are generators on wheels with adjustable floodlights on extendable masts typically up to 30 feet high, with clusters of four Metal Halide fixtures. Aiming these floodlights down is critical to reducing glare, putting more light on the work site, and less light into the sky. Proper aiming of these floodlights when the units are first deployed is important. Once a light has been aimed the first time its used, that is likely how it will remain for its useful lifetime.

Mounting height is again a major factor in determining the area of coverage. Typical practice is to locate towers around the outside perimeter of a site and point the lights inward. In order to maintain adequate coverage with floodlights aimed down, towers must be positioned closer to the center of the site as illumination is now greater in the area around the tower instead of only in front of it. Care must be taken with light tower placement so as not to impede traffic flow around the site.



Light distribution from floodlights aimed to different angles.

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RECOMMENDATIONS:

1) Re-aim existing fixtures - Much can be accomplished without any additional hardware by re-aiming existing fixtures. Many, if not most floodlights in the oil field are pointed toward the horizon. A floodlight aimed horizontally shines half of it's light up away from the ground and into the sky. Aiming the fixtures down puts more light on the worksite, reduces glare and increases visibility. Attention must be given to proper aiming when fixtures are first installed and put to use. Once a light has been aimed the first time its used, that is likely how it will remain for its useful lifetime.

2) Shielding - All light fixtures in use at a given facility can be inventoried, their make and model identified, and fitted with optional manufacturer shields. Shielding floodlights, almost without exception, increases safety by reducing glare. Fixtures can be aimed down when shielding is installed such that no light shines above the horizon. Shielding for other styles of fixtures is also effective for reducing glare, but adequate coverage below the fixture depends on the extent of shielding and mounting height. Many lights are mounted high around the outside perimeter of the main rig platform and are intended to light the ground below. Shielding these fixtures also has the desired effects of reducing glare and increasing illumination in the area around the rig.

3) LEDs - The LED revolution presents an excellent opportunity to re-light all aspects of the industry with greater attention to safety and visibility. LED fixtures offer more cost efficient, solid state control, longer life expectancies, better directionality for glare control, as well as optional motion sensors and built-in security cameras.

CONCLUSION:

The major oil and gas producers all have firm commitments to safety and cost efficiency. Careful and innovative use of lighting, especially LEDs, can improve both. Efforts to convince majors producers should begin with Health, Environment and Safety officers and end with Public Relations departments. Lighting nighttime operations in a manner that increases visibility and reduces skyglow is a win-win proposition.

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